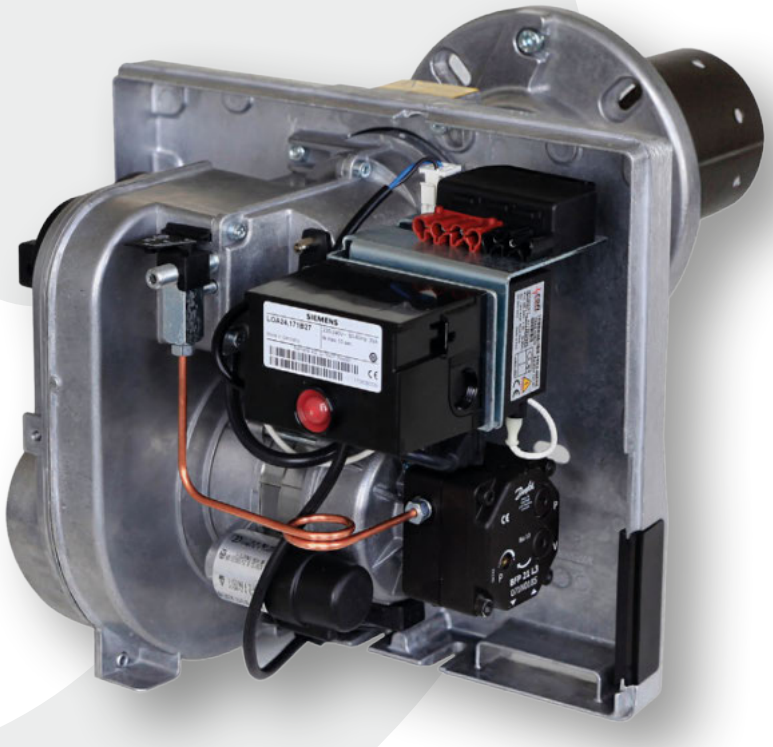
ACV
EXCELLENCE IN HOT WATER

BMV

BMV3 - BMV4 - BMV5

Installation, Operation & Maintenance Instructions



662Y1000 • C

EN

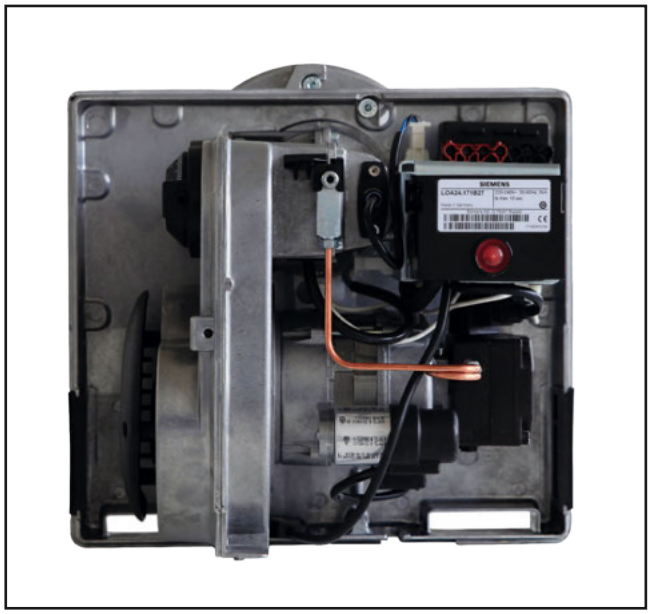


Figure 1

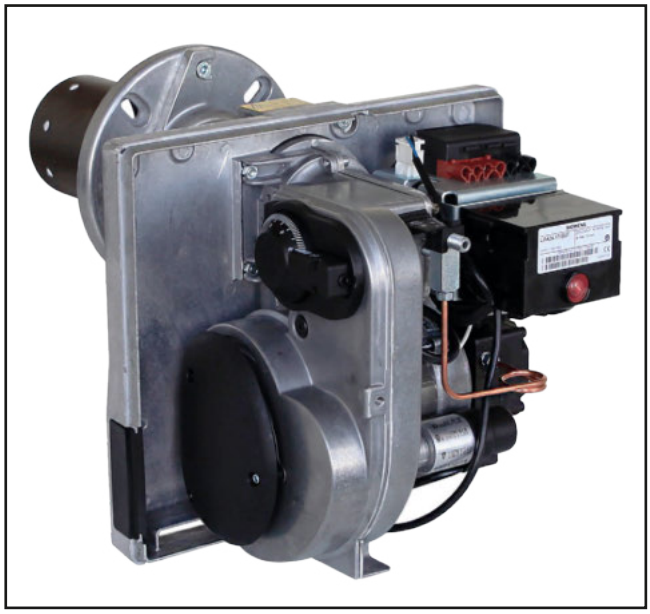


Figure 2 — BMV3 / BMV4 / BMV5

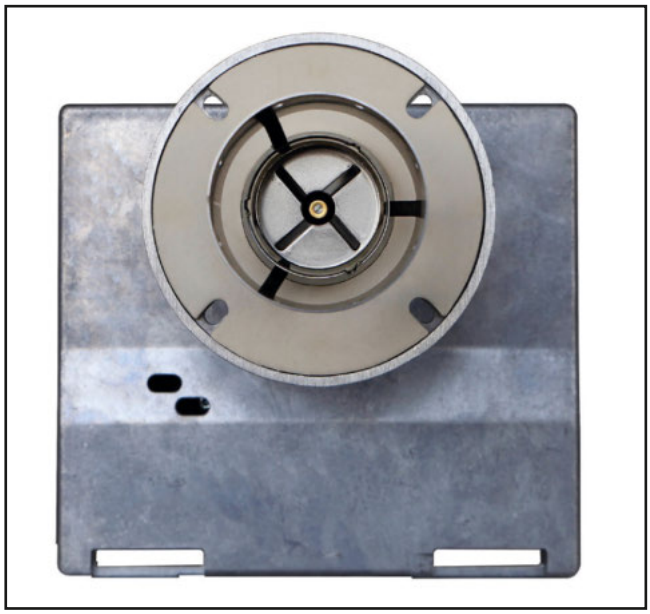


Figure 3 — BMV3 / BMV4

Dear customer,

We are pleased that you have decided to purchase an ACV burner.
The BMV burner model is a modern generation flame burner. The advantage of this burner construction is the extensive energy saving operation with very low emissions (Sampling test according to EN 267:1999-11 Class 3, German environmental label "Blue Angel" according to RAL-UZ 9, Sampling test according to the Swiss Emissions Regulation LRV).
Every burner is checked in the scope of a thorough final inspection. In addition to the hydraulic and electrical parameters, the appearance of the flame is also inspected.
The warranty period as of the date of purchase (receipt date) is 2 years.
Please note that the installation, start up and inspection tasks must be accomplished by a trained technician. The installation and operating instructions that are provided contain important information to this purpose.
We recommend a yearly inspection of the burner by a trained technician to guarantee continuous energy saving and low emission operation.

Table of contents

1. TECHNICAL DATA

1.1. Burner performance

Type	Oil throughput (kg/h)	Burner output (kW)
BMV3	1.4 - 4.1	16 - 48
BMV4	1.4 - 4.1	16 - 48
BMV 5	3.2 - 4.7	38 - 56

* Specifications for units with a low pressure furnace and an exhaust gas loss of approx. 8%.

1.2. Certification

- DIN EN 267:1999-11: register number: 5G966/11
- Class 3 emission limits (only HL60 E/FLV.2-S)
- German ecolabel "Blue Angel" according to RAL-ZU 9: Contract no. 14415 (only HL60 E/FLV.2-S)

1.3. Operating range

- In the chart, you find allowed combustion chamber pressure as function of the oil flow (see fig. 4).
- The operating ranges have been determined on a testing unit and refer to an altitude of approx. 100 m above sea-level and a room temperature of approx. 20°C. The oil flow that can be achieved in practice depends on the starting resistance of the heater.
- The starting resistance is influenced by the combustion chamber, the flue gas line and the starting load. Exact values can therefore only be determined on each respective system.

1.4. Fuel

- Fuel oil EL according to DIN 51603-1
- Heating oil EL, low sulphur, according to DIN 51603-1
- Fuel oil EL A Bio 10 (bio fuel oil according to DIN SPEC 51603-6, fuel oil EL, low sulphur, with up to 10% of FAME according to the quality requirements of DIN 14214)

1.5. Electrical data

Nominal voltage.....230 V ~ 50 Hz
Starting power.....ca. 435 W
Operating power.....ca. 135 - 235 W
Contact rating of the thermostats and switches, ...min. 6A~

1.6. Burner dimensions

Specifications of dimensions in mm (see fig. 5 + 6)
Packing .....l 370 / w 350 / h 485 mm
Transport weight.....14.5 kg

1.7. Acoustic emissions

The sound pressure level at maximum burner performance is 57 dB(A). The measurements were carried out with an accuracy class 2 measuring device according to IEC 60651 at a (horizontal) distance of 2m.

1.8. Burner components

Item	Make	Ref
Motor	Hanning	O1A095-030
Oil pump	Danfoss	BFP 21 L3
Oil pre-heater	Danfoss	FPHE 5
Ignition unit	Cofi	TRK2-40SHK
Photocell	Danfoss	LDS 057H7097
Automatic oil firing unit	Siemens	LOA 24.171B27

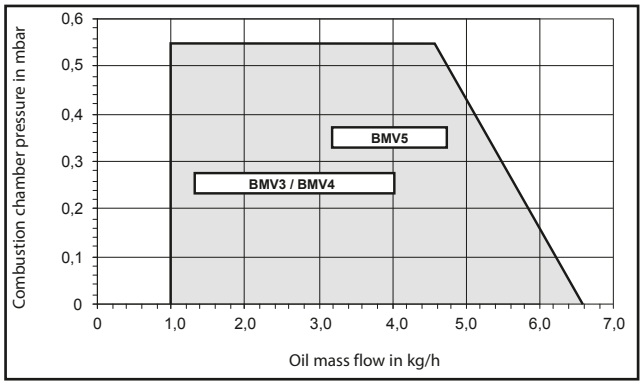


Figure 4

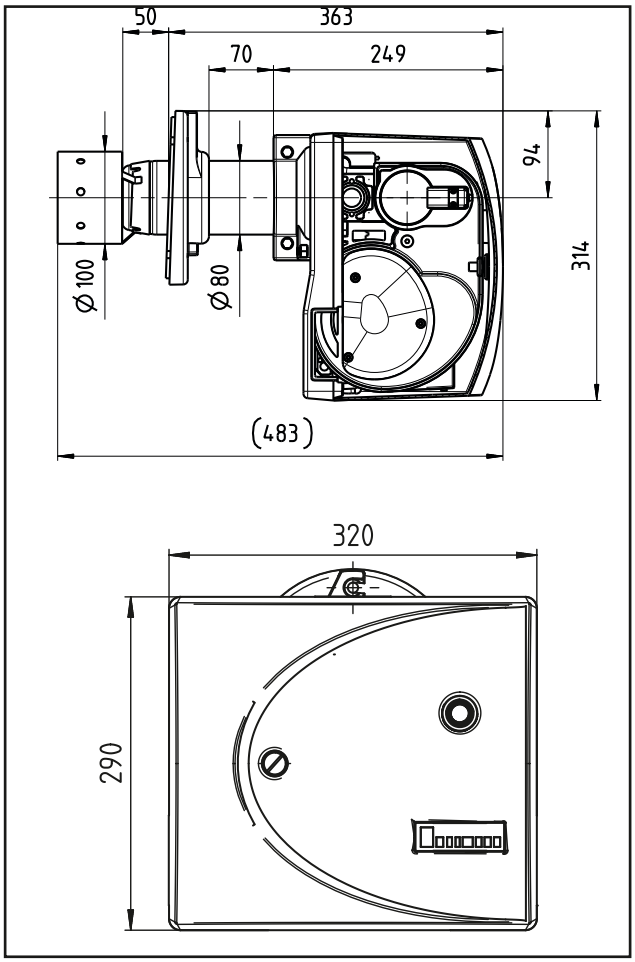


Figure 5

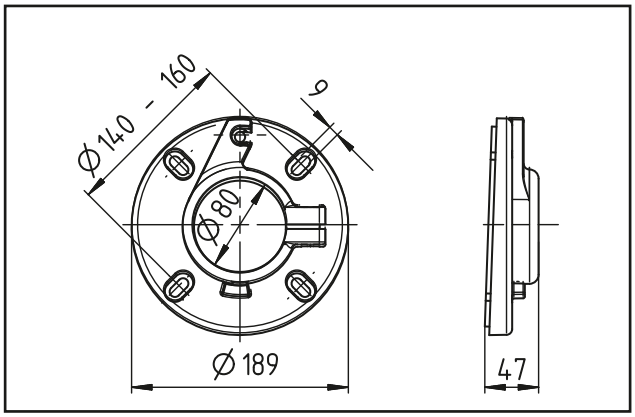


Figure 6

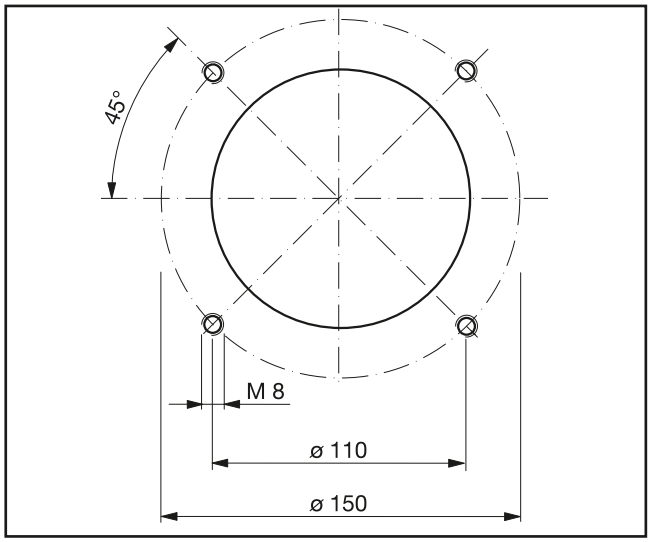


Figure 7

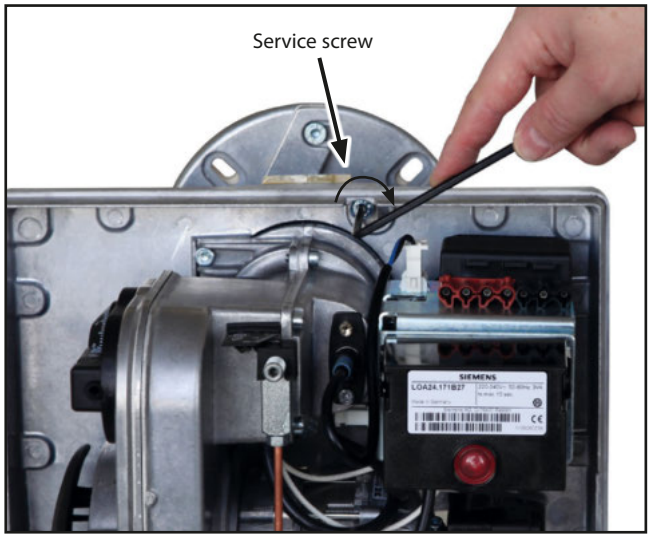


Figure 8

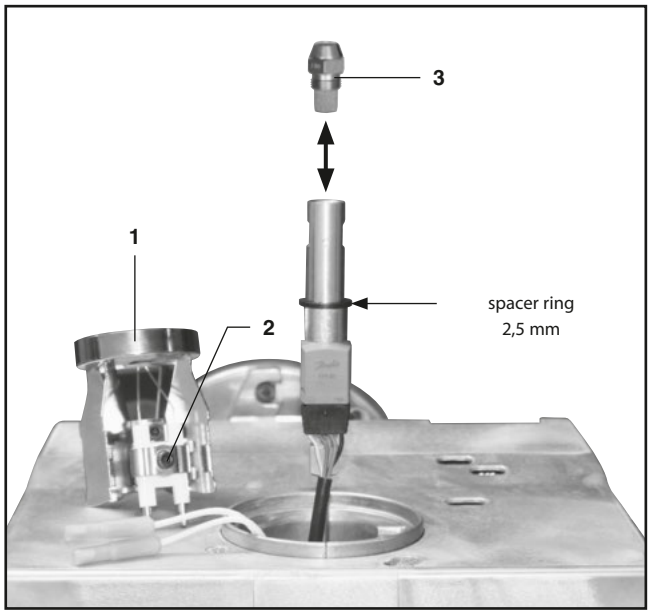


Figure 9

2. ASSEMBLY

2.1. Assembly dimensions

The dimensions of the burner and boiler connection are according to DIN EN 226 (dimensions in mm), see figure 7.

2.2. Installing the burner

- Install sliding flange and seal onto the heat generator using the supplied M8 screws. The mounting screw of the sliding flange must be turned upwards.
- Insert burner with burner pipe into the flange until the burner pipe is flush with the inside of the combustion chamber. Observe special instructions of the heat generator manufacturer, if any.
- Tighten the mounting screw of the flange clamp.

Caution: The flange must be oriented to ensure that the burner is installed with the correct angle (see fig. 6).

- Install the recirculation tube.

2.3. Service position

Loosen the service screw by 1/2 turn using a 4 mm hexagon socket wrench (see fig. 8). Turn the burner to the left and remove it from the burner pipe. Then, place it in the service position (see fig. 9).

2.4. Change of the nozzle

- Loosen screw (2) using a 4 mm hexagon socket wrench and remove the baffle plate (1) (see fig. 9).
- Select a new nozzle according to the required performance range (see table on page 9).
- Remove installed nozzle (3) and screw on the selected nozzle (see fig. 9).
- Check the distance between the baffle plate (1) and the nozzle (3) (see fig. 10).
- Install the baffle plate (1) back in place and tighten the screw (2).

Caution: The baffle plate and nozzle could be hot!

- Control and re-adjust the ignition electrodes if necessary (see fig. 10).
- Bring the burner in operating position and tighten the service screw.

2.5. Nozzle table

The oil flow rate specified in the nozzle table refers to a viscosity of the preheated heating oil of approx. 2 mm2/s.

2.6. Combustion chamber – minimum dimensions

According to GN 267, low-emission combustion values can only be reached if the combustion chamber minimum dimensions are complied with.

Combustion chamber - minimum dimensions		
Oil flow rate	**Diameter resp. height and width**	**Depth from the baffle plate**
1.0 - 2.0 kg/h	**Ø 225 mm**	**250 - 350 mm**
2.0 - 6.0 kg/h	**Ø 300 mm**	**350 - 612 mm**

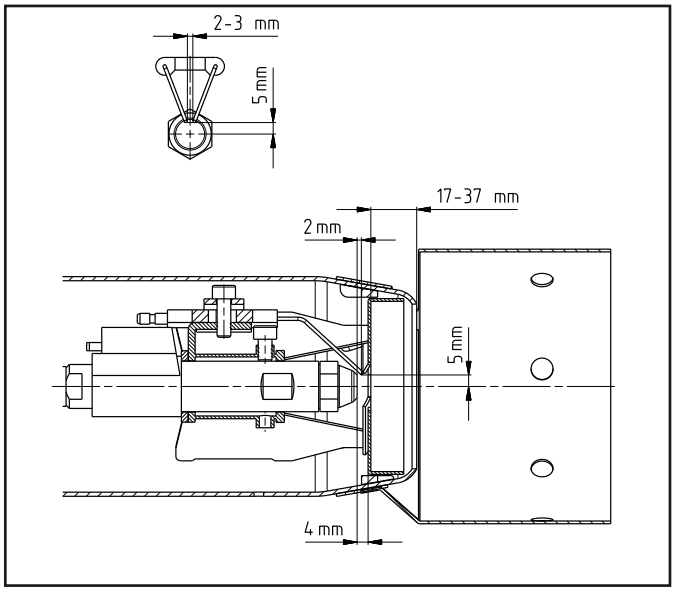


Figure 10

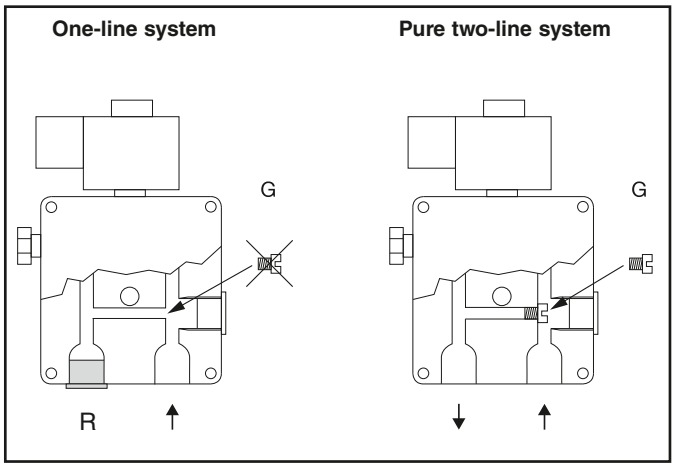


Figure 11

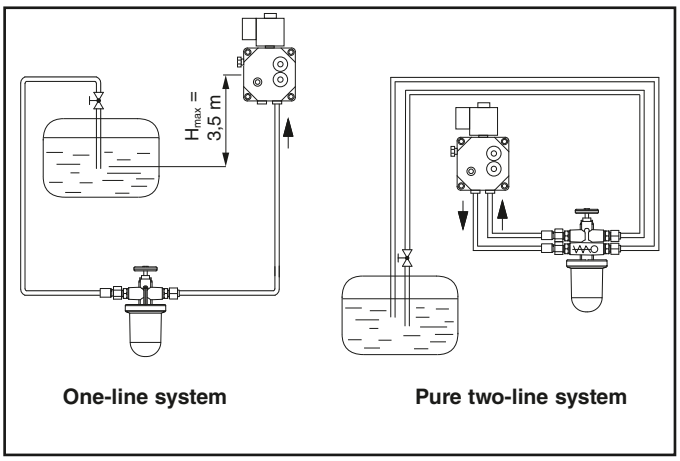


Figure 12

2.7. Oil supply

The construction and installation of the system is to be carried out according to DIN 4755. Local regulations are to be observed. The oil line is to be installed to the burner such that the oil hoses can be connected without any constrain. An oil filter with a quick-close valve is to be installed in the connection on the suction side. A return check valve is to be installed in the return flow line. The burner can be operated in a 1 and 2 pipe system. The burner is delivered for a 2-pipe system as standard. The vacuum in the suction line may not exceed 0.4 bar. With a suction height of more than 3.5 m, an oil circulation pump must be installed. With operation with an oil circulation pump or if the oil tank is located higher than the burner pump, the burner must be operated as a 1-pipe system. If the burner is operated as a 1-pipe system, the return flow R must be closed at the burner pump and screw G must be removed (see fig. 11).
The pressure in the oil line may not exceed 1.5 bar. After complete installation of the oil lines, a leak test must be carried out with a pressure of min. 5 bar according to DIN 4755. The burner may not be connected during the leak test.

2.8. Oil pipes dimensions (see. fig. 12)

Nominal thermal output of the boiler (kW)	**25**	**35**	**45**
Internal pipe Ø (mm)	4	4	4
H* (m)	Max. length of the oil piping (m)		
0	30	30	20
1	30	23	15
2	23	16	10

*H = max. intake height in m (low sulphur fuel oil EL, oil temperature >10 °C, up to 700 m above sea level, 1 filter, 1 check valve, 6x 90° bends).

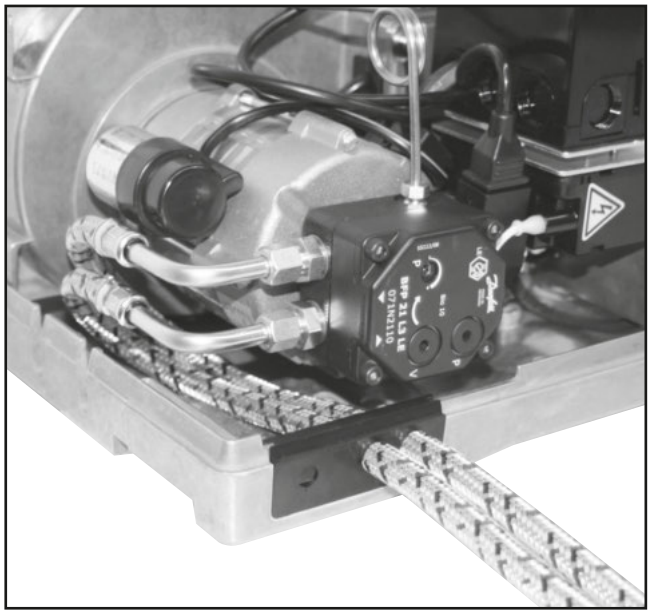


Figure 13

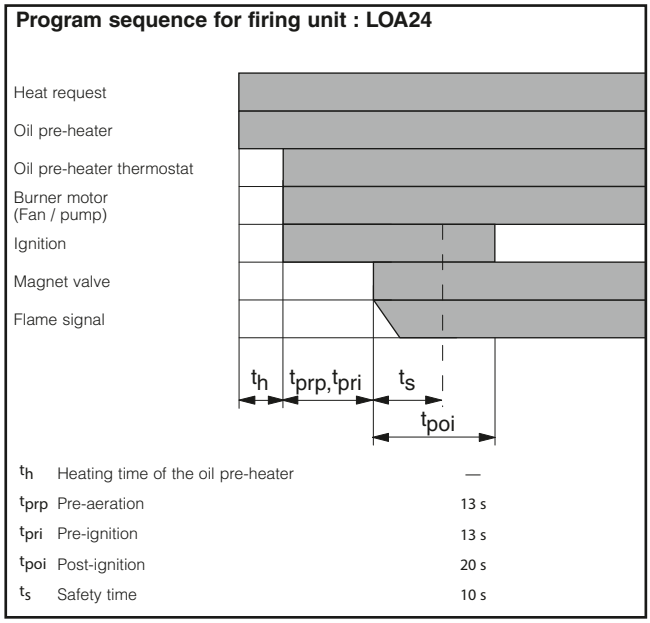


Figure 14

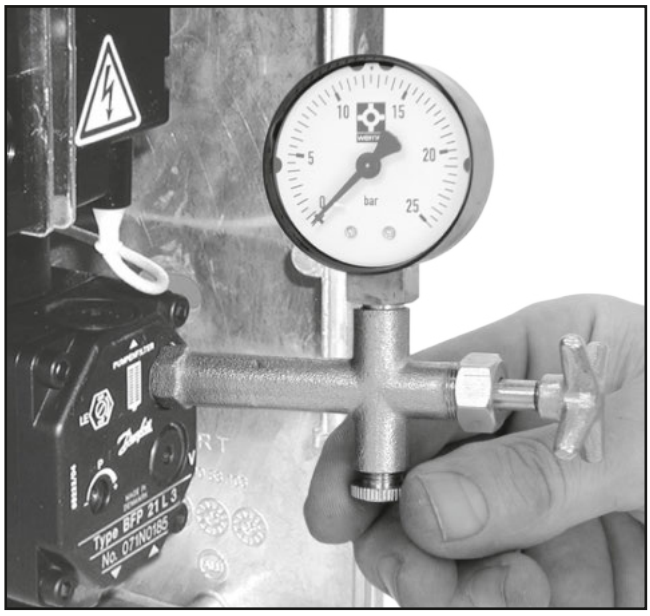


Figure 15

2.9. Flexible oil line connection to the burner

The flexible oil line mounted onto the oil pump can be installed to the left or right side (see fig. 13).

Caution: Remove the plugs from the flexible oil line. When connecting to the oil filter, pay attention to the arrow marking on the connection end of the hoses.

- 3/8" female connection with coupling.

2.10. Electrical connection

The electrical system is to comply with the relevant CE directives, as well as the requirements of the local power utility company. HS, an all-pole circuit breaker with a min. 3 mm contact gap is to be used as main switch. The connection cable must be wired with a 7-pole Euro-plug (plug component) according to DIN 4791 and in accordance with the wiring diagram. The connection is to be made by plugging together the connection cable with the boiler 7-pole Euro-plug (plug component) and the burner 7-pole Euro-plug (socket component). The burner is delivered with a Euro-plug (socket component) as standard.

Caution: Check the Euro-plug (plug component) for proper wiring.

2.11. General inspections

Caution: Before the initial starting up of the burner, the following inspections are to be carried out:

- Is there mains voltage?
- Is the oil supply correct?
- Have the caps been removed from the oil hoses and are the oil hoses properly connected?
- Is the combustion air supply correct?
- Has the burner been properly installed and are the boiler doors closed?
- Is the boiler filled with water?
- Are the boiler and the exhaust gas duct sealed tight?

3. INITIAL OPERATION AND MAINTENANCE

For initial operation of the burner, all necessary switches and controllers must be switched on. If there is voltage at the burner and oil pre-heater, the green indicator lamp lights up and the heating of the oil pre-heaters begins. The heating up time can last up to 2 minutes.
After the target temperature has been reached, the motor starts and the ignition is switched on. After time-out of the preliminary venting time, the solenoid valve opens, the heated oil supply is released, and a flame is formed.
At initial starting up of the burner, if the oil pump does not deliver oil within the safety time, a malfunction shut-off occurs. The burner start-up can be repeated by resetting the automatic oil firing unit.
Venting of the oil pump and the oil line system must be carried out via the manometer connection of the oil pump (see fig. 15).

Caution: Do not allow the oil pump to operate without oil.

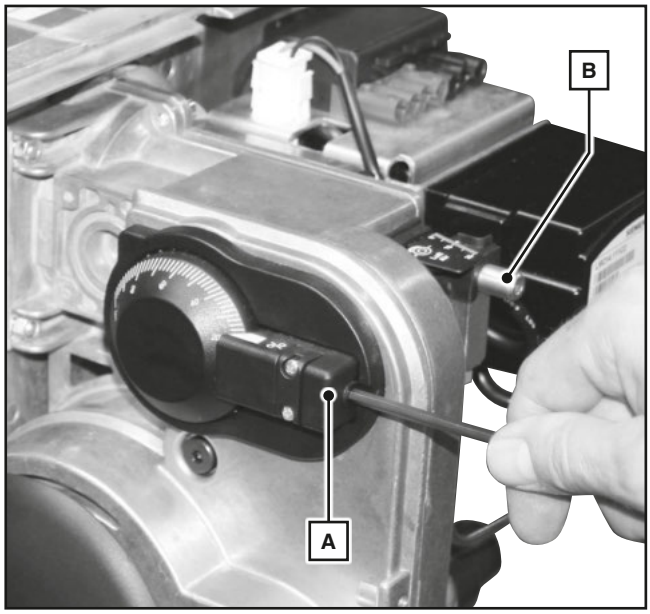


Figure 16

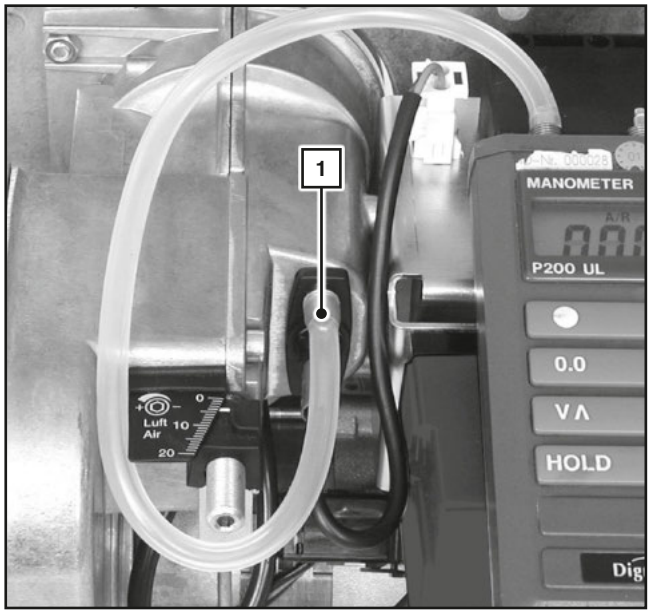


Figure 17

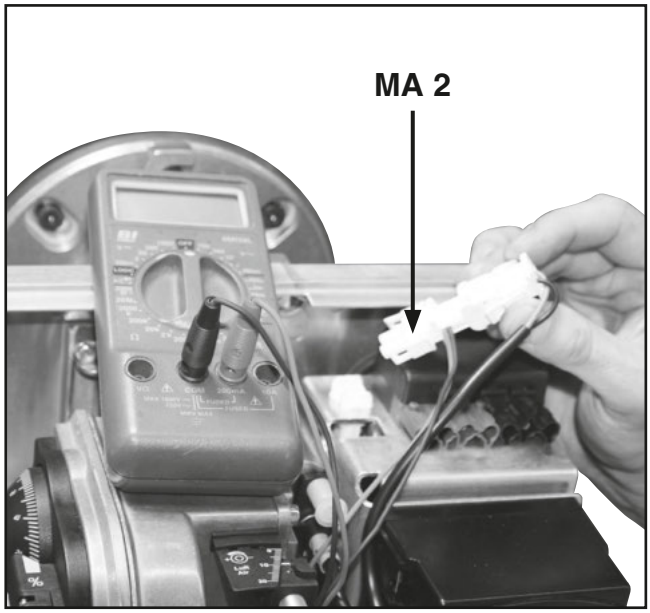


Figure 18

3.1. Adjusting the burner

In order to achieve low-emission combustion values, the burner must be adjusted by measuring the exhaust gas using suitable measuring instruments.
The measuring hole (Ø 8 mm) is to be located at a distance of twice the diameter of the exhaust pipe behind the heater and is to be closed after the measurement.

Caution: The heater and exhaust gas ducts must be sealed tight.

3.2. Chimney draft

In order to achieve constant combustion chamber pressure, a draft damper must be installed in the exhaust gas line. The draft damper must be installed to ensure that the vacuum in the combustion chamber is not more than 0.1 mbar during operation.
For overpressure boilers, refer to the boiler operating instructions to adjust the chimney draft.

3.3. Combustion air

Each burner has been factory-adjusted with a basic air flow rate, according to the installed nozzle. Depending on the combustion chamber and the nozzle tolerance, the basic factory setting leads to an excess of air and must be re-adjusted in all cases. The required quantity of air is determined from the soot contents and the CO_2 measurement. The final adjustment should be performed using the throttle screw.

a. Air flap (see. fig.16)

Turning counter clockwise the air flap set-screw reduces the air flow from the fan. Therefore, the fan pressure measured at the measuring fitting decreases, and the CO_2 content in the exhaust gases increases. Turning the set screw clockwise will open the flap and increase the fan pressure, thus reducing the CO_2 content in the exhaust gases.

b. Baffle plate (see. fig.16)

- By turning clockwise the baffle plate set-screw, the gap between the burner pipe and baffle plate is reduced, thus reducing the combustion air volume while increasing fan pressure and the CO_2 content of the exhaust gases.
- For reverse direction of rotation, the gap width and thus the combustion air volume increases with decreasing fan pressure thus decreasing the CO_2 content in the exhaust gas.

Pay attention that the fan pressure is kept between 2,0 - 3,5 mbar.

We recommend setting a CO_2 content of 12 - 13 vol. %.

Fan pressure measurement is to be carried out at the pressure measurement fitting (1) (see fig. 17).

The soot number may not exceed 0.5 according to the soot number comparison scale.

3.4. Flame monitoring

The photo-current is to be measured in series with the photocell (+pole on terminal 12, max. 5 kOhm inner resistance in the instrument) (see fig. 18).
The photo-current must be between 55 µA and 100 µA at 230 V~ while in operation.
Measuring adapter MA 2 (see fig. 18) available on request.

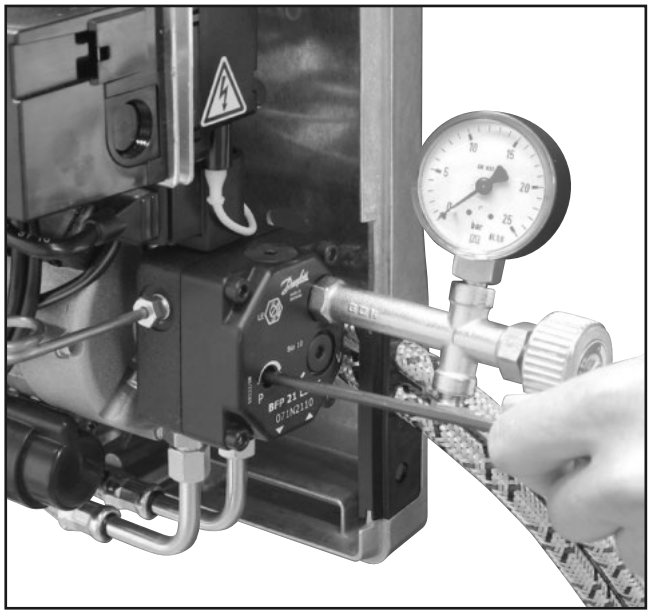


Figure 19

3.5. Oil pressure

We recommend setting the oil pressure between 9 - 14 bar, see table on page 9 (see fig. 19).

3.6. Final and safety tests

After completion of the exhaust gas measurements, the system must be tested for proper and safe operation of the controller and damper as well as of the automatic oil firing system including safety time.

3.7. Chimney

The correct chimney cross-section provides the necessary delivery pressure for proper functioning of the firing system and discharge of the exhaust gases. For the function-related chimney dimensions, the following original values must at least be known:

- Design and rated heat output of the heater
- Exhaust gas flow of the heater
- Exhaust gas temperature at the outlet of the heater
- CO_2 content of the exhaust gas
- Required delivery pressure for supply air, heater and connection piece
- Design and length of the connection piece
- Design of the chimney and effective chimney height
  The design and version of the chimney are to be determined according to DIN 4705 and DIN 18160.

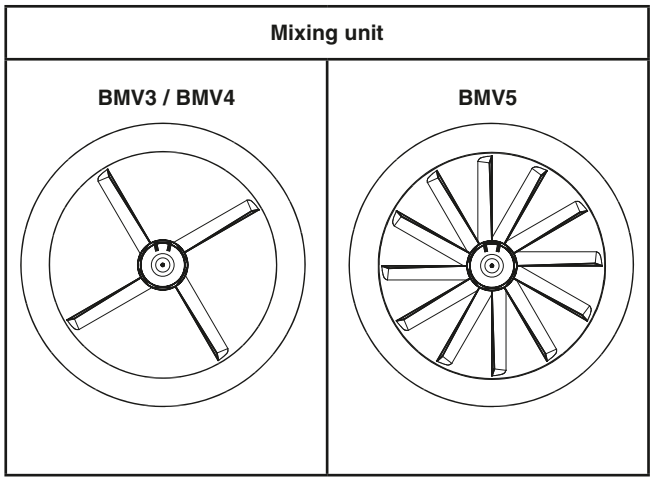


Figure 20

4. BASIC ADJUSTMENT TABLE

Burner model	Burner Output	Oil mass flow	Oil nozzle		Oil pressure	Fan pressure	Air flap scale [A] fig. 16	Baffle plate scale [B] fig. 16
	kW	kg/h	Usgal/h	◁	bar	mbar	%	mm
BMV3	25	2.11	0.60	60°H	10.0	2.5	30	6
BMV4	32	2.70	0.60	60°H	14.5	2.5	32	9
BMV5	43	3.63	1.00	45°H	12.0	2.5	46	10

5. ELECTRIC WIRING DIAGRAM : LOA24

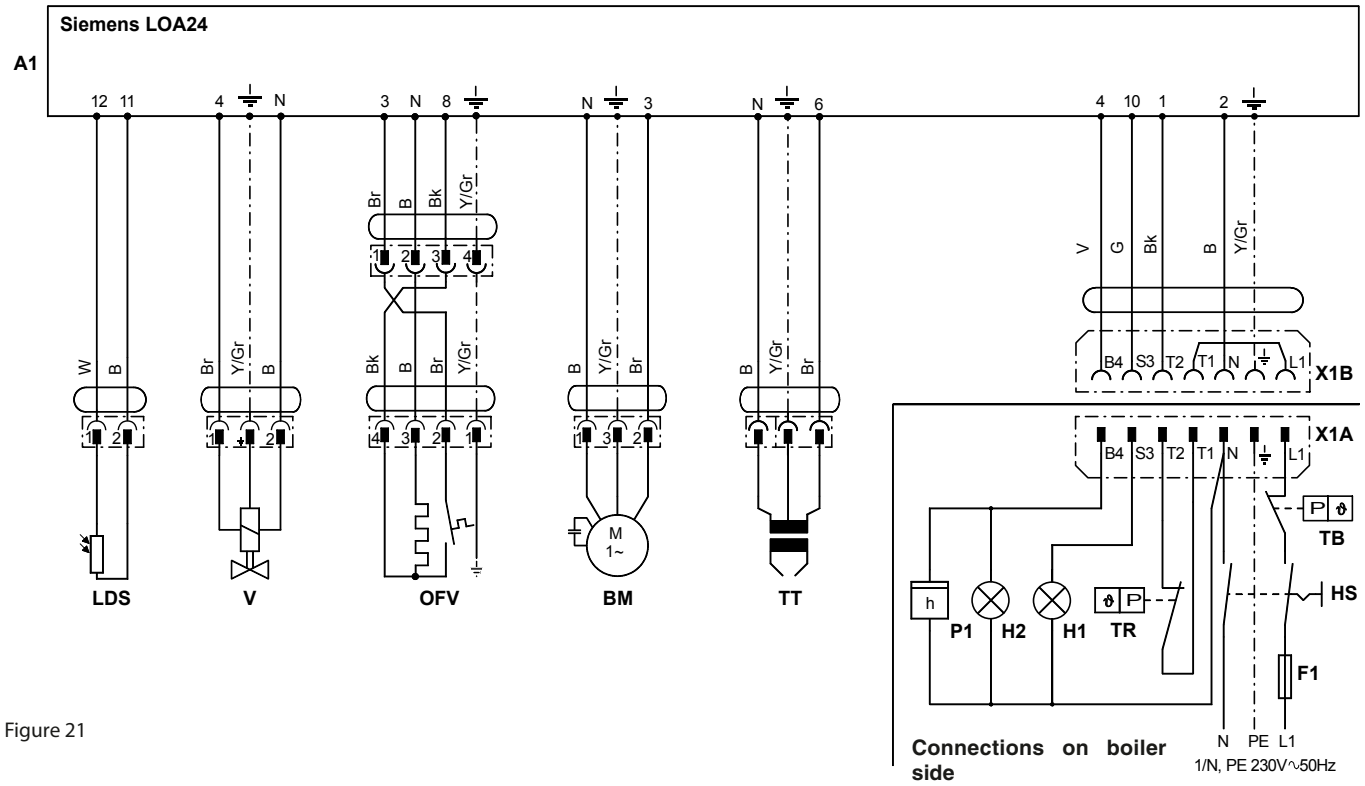


Figure 21

A1 Oil firing unit
BM Burner motor
F1 Fuse max. 6,3 A
H1 Failure signal
H2 Operation signal
HS Main switch
LDS Photocell
OFV Oil Pre-heater
P1 Operating hours counter
TB Temperature or pressure limiter
TR Temperature or pressure controller
TT Ignition unit
V Magnetic valve
X1 Europlug (7 poles)

B Blue
Bk Black
Br Brown
G Grey
V Violet
W White
Y/Gr Yellow / Green

6. BURNER QUICK SERVICE

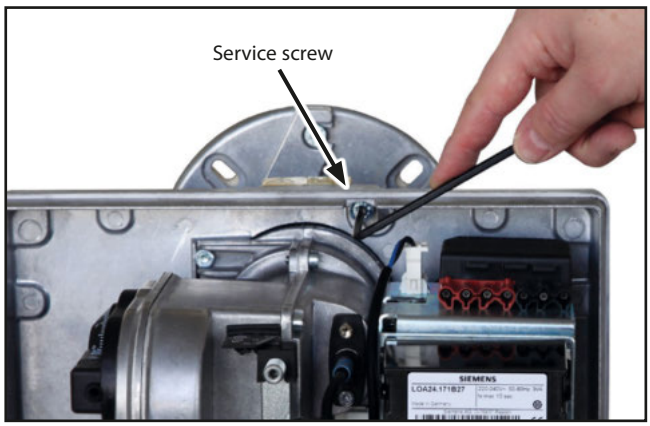


Figure 22 — Loosening of the service screw

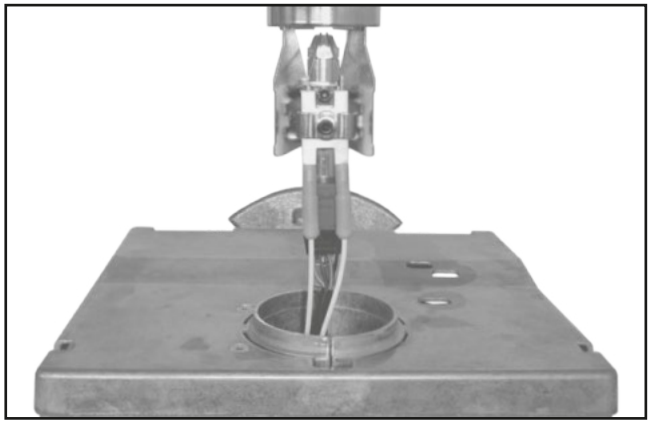


Figure 23 — Service position

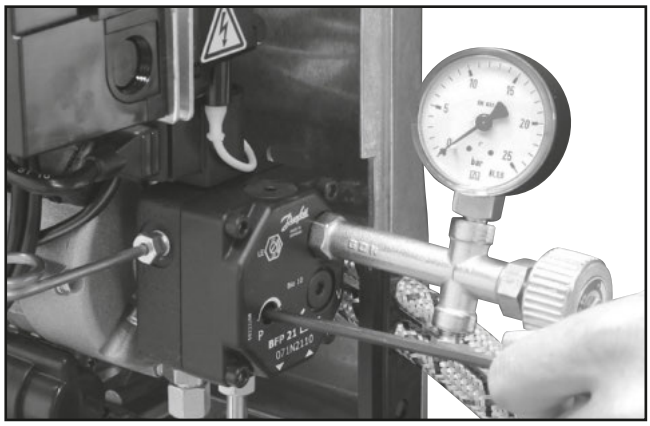


Figure 24 — Measurement and setting oil pressure

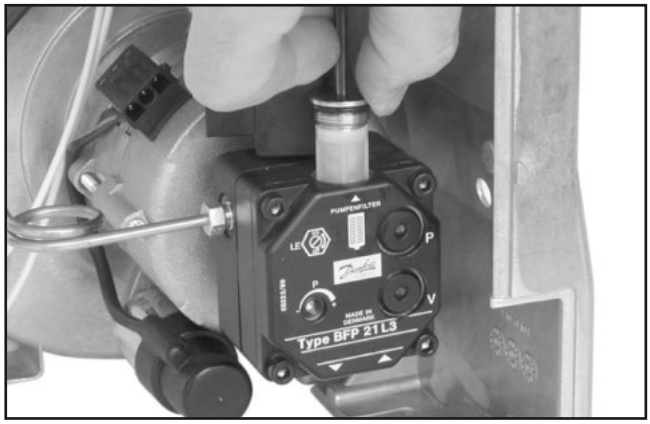


Figure 25 — Disassembly of the oil filter

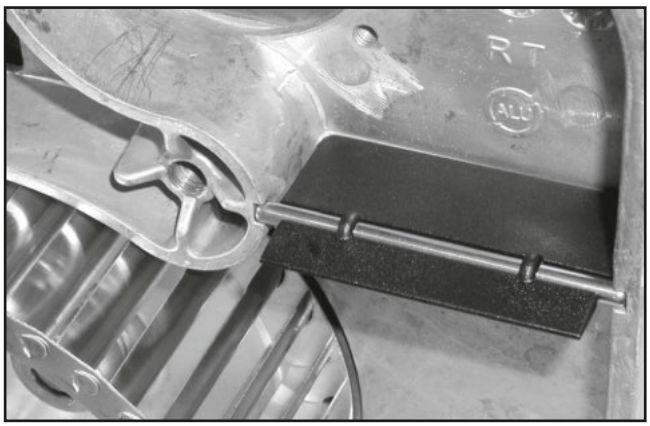


Figure 26 — Installation position of the air flap

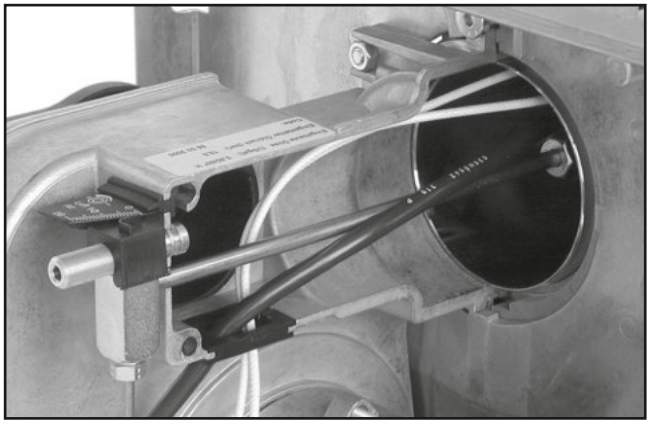


Figure 27 — Disassembly of the nozzle connection cover

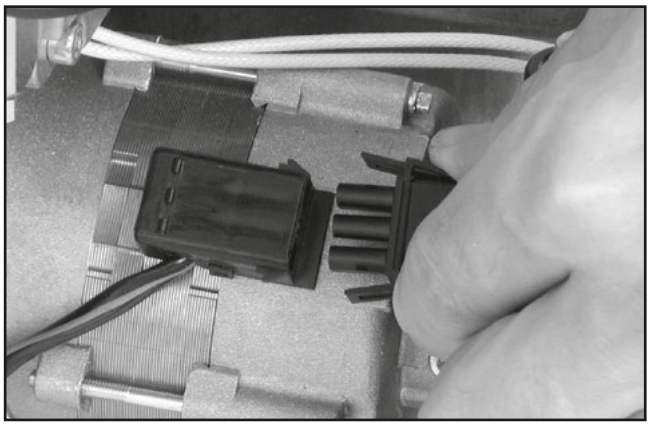


Figure 28 — Plug connection for motor

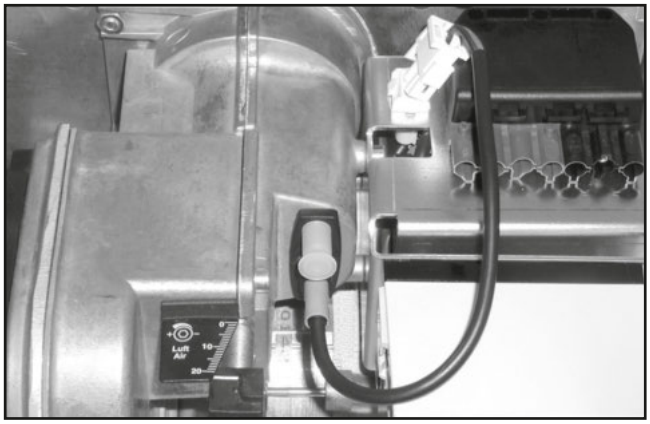


Figure 29 — Connection plug for photocell

7. TROUBLESHOOTING

Diagnostic	Cause	Remedy
1 . Oil firing unit		
Error signal lamp is not on	No voltage present	Check wiring
	Boiler temperature controller incorrectly adjusted	Adjust
Error signal lamp on	Oil firing unit switched to malfunction	Correct malfunction
	Oil firing unit defective	Replace
	Incorrect wiring of terminal socket	Check wiring
		Check oil pre-heater
2 . Motor		
Motor does not start	Defective release thermostat of oil pre-heater	Replace oil pre-heater
	Defective capacitor	Replace capacitor
	Stiff bearing	Replace motor
	Stiff oil pump	Replace oil pump
Loud noise caused by running motor	Motor defective	Replace motor
	Bearing defective	Replace motor
	Oil pump defective	Replace oil pump
3 . Ignition		
No generation of ignition sparks	Ignition unit defective	Replace ignition unit
	Ignition cable defective	Replace ignition cable
	Oil firing unit defective	Replace oil firing unit
	Insulator defective	Replace ignition electrodes
Weak ignition spark	Incorrect position of the ignition electrodes	Position ignition electrodes
	Ignition electrodes severely contaminated	Clean ignition electrodes
4 . Oil pump		
Inconsistent oil pressure, loud noise from operating oil pump, no oil pressure is built up	Intake pipe leaking (air entry)	Check oil supply
	Oil supply not according to the specifications	Check oil supply
	Intake pipe containing air	Purge intake pipe
	Oil stop valve closed	Open stop valve
	Coupling defective	Replace coupling
	Oil pump filter dirty	Clean/replace oil pump filter
	Oil pump drive defective	Replace oil pump
	Paraffin sedimentation (+4 °C)	Install at a frost-free place
	Fuel oil viscous (-1 °C)	Install at a frost-free place
5 . Magnetic valve		
Magnetic valve does not open	Coil of the magnetic valve defective	Replace coil of the magnetic valve
	Oil firing unit defective	Replace oil firing unit
6 . Flame monitoring		
Fault shut-down without flame generation	Extraneous light (photocell current >5,5 µA)	Remove extraneous light
	Photo conductive cell defective	Replace photocell
Fault shut-down with flame generation	Photo conductive cell contaminated	Clean photocell Reset burner
	Photocell current too weak (photocell current < 55 µA)	
7 . Nozzle		
Inconsistent atomisation, high CO and soot emissions	Defective nozzle	Replace nozzle
	Oil pressure not in compliance with specification	Adjust oil pressure
	Diaphragm valve defective	Replace oil pre-heater
8 . Baffle plate		
Baffle plate / burner pipe very contaminated	Incorrect burner adjustment	Adjust burner
	Inconsistent atomisation of the nozzle	Replace nozzle
		Replace oil pre-heater
	Nozzle is dripping	Replace oil pre-heater
	Incorrect nozzle type (spraying angle, spraying characteristics, installation size)	Insert nozzle according to specification
9 . Fan		
Fan delivers not enough air	Fan wheel contaminated	Clean fan wheel
	Fan wheel damaged	Replace fan wheel
Loud noise during fan operation	Fan wheel incorrectly positioned	Correctly position fan wheel
	Fan wheel damaged	Replace fan wheel
	Air flap incorrectly installed	Correctly install air flap